FOODBORNE DISEASE
HANDBOOK

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State Public Health Laboratory
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INTRODUCTION

Foodborne diseases cause an estimated 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the United States each year. Of these, *unknown agents* account for 62 million illnesses, 265,000 hospitalizations, and 3,200 deaths. More than 250 different foodborne diseases have been described, most caused by bacteria, viruses or parasites. The most common causes of foodborne disease are *Campylobacter, Salmonella, E. coli* O157:H7, and Noroviruses. Other illnesses are caused by toxins or poisons contained in food. Many of the pathogens that are transmitted through food are also spread through water or from person-to-person or animal-to-person contact.

This resource is intended to provide assistance in dealing with foodborne illness. When working with outbreaks of foodborne illness, a reasonable effort should be made to determine the probable cause of the outbreak. This will help to ensure that the correct laboratory testing is performed. It is important to remember that each type of agent (bacterial, viral or parasitic) has its own collection and transport conditions. Bacteria cannot be isolated from samples collected for parasites and samples submitted for parasite examination cannot be tested for bacteria. Likewise, viral testing cannot be performed on samples submitted for bacteria or parasites. However, requests for isolation of more than one organism from a single clinical sample can be made if transport conditions (transport media, temperature, etc.) are the same. Kits for specimen submission are available at the Missouri State Public Health Laboratory (MSPHL), free of charge, and can be obtained by calling (573) 751-4830 or ordered from the MSPL web site at http://www.dhss.mo.gov/Lab/OrderForm.html. Detailed directions on specimen collection and transport can be found in the Communicable Disease Reference Manual (CDRM), available online at www.dhss.mo.gov/CDManual, and on the MSPHL website at www.dhss.mo.gov/Lab.

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Disease By Onset		
Upper gastrointestinal tract symptoms (nausea, vomiting) occur first or predominate:		
Onset (time to symptoms):	**Predominant symptoms:**	**Organism to suspect:**
1-6 hours (usually 2-4 hours)	Nausea, vomiting, abdominal cramps, diarrhea	Bacillus cereus (emetic toxin-producing) Staphylococcus aureus
10-72 hours (usually 24-48 hours)	Nausea, vomiting, abdominal cramps, diarrhea (vomiting may predominate in children; diarrhea may predominate in adults)	Noroviruses
24-72 hours (usually 48 hours)	Nausea, vomiting, fever, abdominal pain, watery diarrhea	Rotaviruses
2-30 days (usually 7 days)	Nausea, abdominal pain and cramps, vomiting common in children, diarrhea common in adults (may be profuse and watery), fever	Cryptosporidium parvum
Lower gastrointestinal tract symptoms (abdominal cramps, diarrhea) occur first or predominate:		
Onset (time to symptoms):	**Predominant symptoms:**	**Organism to suspect:**
6-24 hours (usually 6-12 hours)	Abdominal cramps, diarrhea, sometimes nausea and vomiting	Bacillus cereus (diarrheal toxin-producing) Clostridium perfringens
10-72 hours (usually 24-48 hours)	Abdominal cramps, diarrhea, nausea, vomiting, (vomiting may predominate in children; diarrhea may predominate in adults)	Noroviruses
12-72 hours	Abdominal cramps, diarrhea (may be bloody or mucoid), fever, chills, malaise, headache	Salmonella species Shigella species Pathogenic E. coli Vibrio species Yersinia species Campylobacter species Rarely Aeromonas or Plesiomonas species
3 days-6 weeks (usually 7-10 days)	Chronic diarrhea (loose, fatty stools), abdominal pain, gas, fatigue, weight loss	Giardia lamblia

Lower gastrointestinal tract symptoms (abdominal cramps, diarrhea) occur first or predominate (continued):		
Onset (time to symptoms):	**Predominant symptoms:**	**Organism to suspect:**
3 days-several months (usually 2-4 weeks)	Abdominal pain, diarrhea (may be bloody), headache, drowsiness, constipation may alternate with diarrhea	Entamoeba histolytica
2-30 days (usually 7 days)	Diarrhea in adults (may be profuse, watery), nausea and vomiting in children, abdominal pain, cramping, fever	Cryptosporidium parvum
1-11 days (usually 7 days)	Protracted, often relapsing diarrhea (may last up to 7 weeks), fatigue, cramping, weight loss, anorexia	Cyclospora cayetanensis
3-10 days	Diarrhea (usually more than a week), respiratory symptoms	Adenoviruses (types 40 and 41)

Submitting Specimens for Bacterial Testing

IMPORTANT: Testing for the agents *Clostridium perfringens**, *Bacillus cereus** and *Staphylococcus aureus** is offered only during outbreak situations. Testing for these organisms is not routinely performed at the Missouri State Public Health Laboratory. Prior authorization MUST be obtained before submitting samples for these agents. It is also important to note that clinical specimens will not be tested without concurrent submission of suspected food(s).

Organism suspected:	Proper specimen:	Transport conditions:
Bacillus cereus*	Stool	Cold, **NO** transport media
	Vomitus	Cold, **NO** transport media
Campylobacter	Stool	Cold, **ENTERIC** transport media
Clostridium perfringens*	Stool	Cold, **NO** transport media
E. coli (pathogenic)	Stool	Cold, **ENTERIC** transport media
Salmonella	Stool	Cold, **ENTERIC** transport media
Shigella	Stool	Cold, **ENTERIC** transport media
Staphylococcus aureus*	Stool	Cold, **ENTERIC** transport media
	Vomitus	Cold, **NO** transport media
Vibrio	Stool	Cold, **ENTERIC** transport media
Yersinia	Stool	Cold, **ENTERIC** transport media

Collect stools during active diarrhea, as soon as possible after onset of symptoms and before antibiotic treatment.

Food Collection and Submission

1. Foods should be held under similar temperature conditions for transport, as at the time of sampling: that is, hot, room temperature or cold foods shipped cold; frozen foods shipped frozen.
2. Suspect foods must be transported to the lab in the most expedient manner.
3. Specific directions for collection and transport of specimens are listed in the Communicable Disease Reference Manual (CDRM), foodborne section.

Submitting Specimens for Viral Testing

IMPORTANT: Testing for Noroviruses* is offered only during outbreak situations. Testing for Noroviruses on a single specimen is not routinely performed at the State Public Health Laboratory. Outbreak testing will be performed on no less than 3-10 samples, collected from different patients.

Organism suspected:	Proper specimen:	Transport conditions:
Adenovirus	**Stool**	Cold, **NO** transport media
Noroviruses*	**Stool**	Cold, **NO** transport media
	Vomitus	Cold**, NO** transport media
Rotavirus	**Stool**	Cold, **NO** transport media

Collect stools (unmixed with urine) and vomitus as soon as possible after onset of symptoms – preferably within 48 hours, but no later than 72 hours, after onset.

Submitting Specimens for Parasitic Testing

Organism suspected:	Proper specimen:	Transport conditions:
Cryptosporidium	Stool	Room temperature; **PVA** and **Formalin preservatives**
Cyclospora	Stool	Room temperature; **PVA** and **Formalin preservatives**
Giardia	Stool	Room temperature; **PVA** and **Formalin preservatives**

Collect stools any time after onset of symptoms, but preferably as soon as possible after onset.

Food/Agents Commonly Associated with Foodborne Illness

Suspected Food Vehicle:	Consider testing for:
Beef and beef products	Salmonella sp. Clostridium perfringens Staphylococcus aureus Campylobacter sp E. coli O157:H7
Canned foods (especially home-canned)	Clostridium botulinum toxin (Botulism)
Cereals or foods containing cornstarch	Bacillus cereus
Cheese	Staphylococcus aureus Salmonella sp. Pathogenic E.coli
Soft cheeses	Staphylococcus aureus Salmonella sp. Pathogenic E.coli Listeria sp.
Chick peas, garbanzo beans	Clostridium perfringens Bacillus cereus
Confectionery products	Salmonella sp Staphylococcus aureus
Corned beef	Salmonella sp Staphylococcus aureus
Cream-filled baked goods, custards	Salmonella sp Staphylococcus aureus Bacillus cereus
Egg and egg products	Salmonella sp
Fermented meats	Staphylococcus aureus

Food/Agents Commonly Associated with Foodborne Illness

Suspected Food Vehicle:	Consider testing for:
Fish	Vibrio sp Aeromonas sp. Plesiomonas sp. Fish parasites
Fruits (raw), Unpasteurized fruit drinks	Shigella sp. Cyclospora sp. Cryptosporidium sp. Pathogenic E. coli
Ham	Staphylococcus aureus
Hamburger	E. coli O157:H7 Salmonella sp.
Mayonnaise	E. coli O157:H7
Melon	Salmonella sp. Pathogenic E. coli Shigella sp.
Mexican foods	Clostridium perfringens Bacillus cereus Salmonella sp. Shigella sp. Staphylococcus aureus
Milk (unpasteurized)	Salmonella sp. Campylobacter sp. Listeria sp. Yersinia enterocolitica Staphylococcus aureus
Milk (dry)	Salmonella sp. Staphylococcus aureus
Oriental foods	Bacillus cereus Vibrio sp.

Food/Agents Commonly Associated with Foodborne Illness

Suspected Food Vehicle:	Consider testing for:
Pasta or foods containing pasta	Bacillus cereus Staphylococcus aureus Pathogenic E. coli
Pork	Salmonella sp. Campylobacter sp. Staphylococcus aureus Clostridium perfringens Yersinia sp. Intestinal parasites
Potato	Bacillus cereus Clostridium botulinum toxin
Poultry or foods containing poultry	Salmonella sp. Campylobacter sp. Staphylococcus aureus Clostridium perfringens Yersinia sp.
Improperly washed vegetables (lettuce), herbs (basil, parsley), berries	Shigella sp. Pathogenic E. coli Cyclospora sp.
Rice	Bacillus cereus
Salads (also may contain poultry, egg, meats or fish)	Salmonella sp. Shigella sp. Staphylococcus aureus Pathogenic E. coli Noroviruses
Shellfish	Vibrio sp Aeromonas sp. Plesiomonas sp.
Smoked meats, poultry or fish products	Salmonella sp. Staphylococcus aureus Clostridium botulinum toxin
Soups, stews, chowders, gumbos	Bacillus cereus Clostridium perfringens

Resources and References

For more information on foodborne illness, submitting samples or to order specimen submission kits, contact the State Public Health Laboratory at **(573) 751-0633**, during working hours.

For after-hours assistance, the DHSS Hotline number is available 24/7: **1-800- 392-0272**

Information on sample collection and submission is also available on the State Public Health Laboratory website at:
www.dhss.mo.gov/Lab/index.html

To e-mail a general question to the State Public Health Laboratory:
info@dhss.mo.gov

CDC's Foodborne and Diarrheal Diseases Branch (FDDB) can be accessed online at:
http://www.cdc.gov/foodborne/index.htm

Communicable Disease Reference Manual, Foodborne Section
www.dhss.mo.gov/CDManual

Other references:

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